

CLAIMS

1. A process for focusing and temporal compression of acoustic energy into at least one location, which comprises:
 - a) causing an emission from said location of an acoustic pulse, having a first duration,
 - b) gathering acoustic signals coming from said location through a multi-scattering medium on an array of transducers and recording said acoustic signals, for a second duration greater by at least one order of magnitude than the first duration; and
 - c) emitting return signals obtained by temporal inversion and amplification of the signals gathered during the second duration toward the multi-scattering medium, from said transducers.
2. A process according to Claim 1, wherein the multi-scattering medium has a greater angular aperture than said array, viewed from said location.
3. A process according to Claim 1, wherein the temporally inverted signals are amplified with a gain which is an increasing function of the time of arrival at the transducers.
4. A process according to Claim 1, wherein the return signals in step c) are of constant amplitude and have the sign of the recorded signals.
5. A process according to Claim 1, wherein the return signals are modulated by a message to be transmitted.
6. A process according to Claim 1, wherein steps (a) and (b) are performed once in the course of a calibrating phase and the return signals are emitted repetitively, the multi-scattering medium being stationary.
7. A process according to Claim 1, wherein the multi-scattering medium has an aperture, and wherein step (a) comprises emitting from the transducer array an illumination beam through the aperture of the multi-scattering medium, and reflecting the illumination beam by a reflecting target defining said location.

8. A process according to Claim 1, wherein step (a) comprises emitting from a transducer not belonging to the array an illumination beam, and reflecting the illumination beam by a reflecting target defining said location.

9. A process according to Claim 1, wherein said multi-scattering
5 medium comprises a propagation medium and distributed reflecting elements.

10. A process according to Claim 9, wherein the reflecting elements are distributed within the volume of the propagation medium.

11. A process according to Claim 9, wherein the reflecting elements are distributed at a periphery of the propagation medium.

12. A process according to Claim 11, wherein the reflecting elements consist of discontinuities of acoustic impedance between the propagation medium and an outside medium.

13. A device for focusing and temporal compression of acoustic energy into at least one location, comprising:

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- means for causing emission of a brief acoustic pulse from said location;
 - an array of transducers;
 - a multi-scattering medium to be interposed between the transducer array and said location, and arranged to provide a time spreading of the acoustic pulse so as to increase the duration of said pulse by at least
20 one order of magnitude at the level of the transducer array,

the transducer array being controlled to emit acoustic signals obtained by temporal inversion and amplification of acoustic signals picked up in response to the emission of said pulse.

14. A device according to Claim 13, wherein the multiscattering medium
25 has a thickness substantially greater than a mean free path of acoustic waves in said medium.

15. A device according to Claim 13, comprising means defining an acoustic channel.

16. A device according to Claim 15, wherein the transducer array is oriented toward a wall of the acoustic channel.